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# Junos Continuity Software User Guide (Junos OS Release 14.1R4 and Later Releases)



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# About the Documentation

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## Documentation and Release Notes

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To obtain the most current version of all Juniper Networks® technical documentation, see the product documentation page on the Juniper Networks website at <https://www.juniper.net/documentation/>.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

Juniper Networks Books publishes books by Juniper Networks engineers and subject matter experts. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration. The current list can be viewed at <https://www.juniper.net/books>.

## Using the Examples in This Manual

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If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

## Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xml;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

## Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
  file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see [CLI Explorer](#).

## Documentation Conventions

Table 1 on page xi defines notice icons used in this guide.

Table 1: Notice Icons







Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 2 on page xii defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  user@host> <b>configure</b>
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> <b>show chassis alarms</b>  No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none"> <li>Introduces or emphasizes important new terms.</li> <li>Identifies guide names.</li> <li>Identifies RFC and Internet draft titles.</li> </ul>	<ul style="list-style-type: none"> <li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li> <li><i>Junos OS CLI User Guide</i></li> <li>RFC 1997, <i>BGP Communities Attribute</i></li> </ul>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name:  [edit] root@# <b>set system domain-name</b> <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> <li>To configure a stub area, include the <b>stub</b> statement at the [edit protocols <b>ospf area area-id</b>] hierarchy level.</li> <li>The console port is labeled <b>CONSOLE</b>.</li> </ul>
< > (angle brackets)	Encloses optional keywords or variables.	<b>stub</b> <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	<b>broadcast</b>   <b>multicast</b>  ( <i>string1</i>   <i>string2</i>   <i>string3</i> )
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp { # Required for dynamic MPLS only</b>
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	<b>community name members</b> [ <b>community-ids</b> ]
Indentation and braces ( { } )	Identifies a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	

## GUI Conventions

Table 2: Text and Syntax Conventions (continued)

Convention	Description	Examples
<b>Bold text like this</b>	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> <li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li> <li>To cancel the configuration, click <b>Cancel</b>.</li> </ul>
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

## Documentation Feedback

We encourage you to provide feedback so that we can improve our documentation. You can use either of the following methods:

- Online feedback system—Click TechLibrary Feedback, on the lower right of any page on the [Juniper Networks TechLibrary](#) site, and do one of the following:



- Click the thumbs-up icon if the information on the page was helpful to you.
- Click the thumbs-down icon if the information on the page was not helpful to you or if you have suggestions for improvement, and use the pop-up form to provide feedback.
- E-mail—Send your comments to [techpubs-comments@juniper.net](mailto:techpubs-comments@juniper.net). Include the document or topic name, URL or page number, and software version (if applicable).

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Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active Juniper Care or Partner Support Services support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

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- Product warranties—For product warranty information, visit <https://www.juniper.net/support/warranty/>.
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- Search for known bugs: <https://prsearch.juniper.net/>
- Find product documentation: <https://www.juniper.net/documentation/>
- Find solutions and answer questions using our Knowledge Base: <https://kb.juniper.net/>
- Download the latest versions of software and review release notes: <https://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <https://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum: <https://www.juniper.net/company/communities/>
- Create a service request online: <https://myjuniper.juniper.net>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://entitlementsearch.juniper.net/entitlementsearch/>

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- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <https://support.juniper.net/support/requesting-support/>.

## PART 1

# Overview

- [Junos Continuity Software Overview on page 3](#)
- [Using Junos Continuity Software to Upgrade Line Cards on page 7](#)
- [Hardware Components Supported by Junos Continuity Software on page 9](#)





## CHAPTER 1

# Junos Continuity Software Overview

- [Junos Continuity Software Overview on page 3](#)
- [Junos Continuity Software Package Naming Conventions on page 4](#)
- [Hardware Supported by Junos Continuity Software on page 5](#)

## Junos Continuity Software Overview

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Junos Continuity is a software package that enables you to deploy new hardware in the network without the need to upgrade Juniper Networks Junos operating system (Junos OS). Junos Continuity software works like a pluggable software module that enables you to deploy new hardware by providing the drivers and support files required to bring the hardware online. Each version of the Junos Continuity software package supports a specific type of hardware, such as Modular Port Concentrators (MPCs), power supply modules, and so on. You can download and install the Junos Continuity software package that supports the hardware component that you want to deploy.

You can install Junos Continuity software to add support for new hardware on elected releases of Junos OS. An elected release is a maintenance release of Junos OS, which supports Junos Continuity software. You need to download the Junos Continuity software package that is specific to the elected release.

Junos Continuity software standalone package is supported only on the MX240, MX480, MX960, and MX2000 Universal Routing Platforms.

You install the Junos Continuity software package to enable a router to support new hardware without the need to upgrade Junos OS. You can install the Junos Continuity software package as a standalone package or as a package bundled with Junos OS.

- **Install the Standalone Junos Continuity Plug-in**—You install the Standalone Junos Continuity Plug-in if the version of Junos OS that is installed on the router supports Junos Continuity software.
- **Install the Junos Continuity Plug-in Integrated with Junos OS**—You use the integrated package if the version of Junos OS that is installed on the router does not support the Standalone Junos Continuity Plug-in. For example, if you want to install Junos Continuity software on Junos OS Release 13.3, you can use the integrated package that contains both Junos OS Release 15.1F4 and the Junos Continuity Plug-in. This is a one-step process to upgrade Junos OS to Junos OS Release 15.1F4 and also to install Junos Continuity software.

**Table 3: Junos OS Support for Junos Continuity Software**

Junos OS Release	Supports Junos Continuity?	Description
Junos OS Release 14.1R4	Yes	Install the Standalone Junos Continuity Plug-in and then make the line cards operational.  Restart of the router is not required in this case.
Releases older than 14.1R4 (For example, Junos OS Release 13.3)	No	Install the Junos Continuity Plug-in Integrated with Junos OS package. This package contains the Junos Continuity Plug-in and the Junos OS release that supports it.  This method requires you to restart the router for the changes to take effect because installing the integrated package also results in upgrading Junos OS.
Junos OS Release 14.2R3	Yes	Install the Standalone Junos Continuity Plug-in and then make the line cards operational.
Junos OS Release 15.1F4  Junos OS Release 15.1F5	Yes	For Junos OS Releases 15.1 and later, install the Standalone Junos Continuity Plug-in that is specific to the Junos OS release and then bring the line cards online.  Restart of the router is not required.

**Release History Table**

Release	Description
15.1	For Junos OS Releases 15.1 and later, install the Standalone Junos Continuity Plug-in that is specific to the Junos OS release and then bring the line cards online.

**Related Documentation**

- [Junos Continuity Software Package Naming Conventions on page 4](#)
- [Line Card Upgrade Using Junos Continuity Software Overview on page 7](#)
- [FAQ: Junos Continuity Software for MX Series Routers](#)
- [Pathfinder: Hardware Supported by Junos Continuity Software](#)

## Junos Continuity Software Package Naming Conventions

This topic describes the naming conventions that are followed for the Junos Continuity software standalone package and for the Junos Continuity software package bundled with Junos OS.

The Junos Continuity software standalone package has the following naming convention:

**jam-package-name-architecture-bit-release-Cx.y.tgz**

Where:

- **jam-package-name** is the name of the Junos Continuity software package.
- **architecture-bit** indicates the architecture that the package supports and the flavor of the operating system. For example, **architecture-bit** value **x86-32** indicates that the software package is for 32-bit Junos OS and supports the x86 architecture.
- **release** is the Junos OS release that supports the Junos Continuity software package. The Junos Continuity software package is developed for a specific Junos OS release and can be used only with that release.
- **Cx.y** is the Junos Continuity software package version, where **C** represents Junos Continuity and **x.y** stands for the software release number—for example, 1.3.

For example, **jam-mpc7-8-9-x86-32-15.1F4.10-C1.6.tgz**.

The Junos Continuity software package bundled with Junos OS has the following naming convention:

**package-name-jam-platform-architecture-bit-release-Nx.y.tgz**

Where:

- **package-name** is the name of the bundled package.
- **jam** indicates the presence of Junos Continuity software.
- **platform** is the hardware platform that supports the package. For example, the **platform** value **mx** indicates that the package is for MX Series 5G Universal Routing Platforms.
- **architecture-bit** indicates the architecture that the package supports and the flavor of the operating system. For example, **architecture-bit** value **x86-32** indicates that the software package is for 32-bit Junos OS and supports the x86 architecture.
- **release** is the Junos OS release that is used in the bundled package.
- **Nx.y** is the integrated Junos Continuity software package version, where **N** represents the Junos Continuity software package bundled with Junos OS and **x.y** stands for the software release number—for example, 1.2.

The integrated package may contain one more Junos Continuity software packages.

For example, **junos-install-jam-mx-x86-32-15.1F4.10-N1.6.tgz**.

#### Related Documentation

- [Junos Continuity Software Overview on page 3](#)

## Hardware Supported by Junos Continuity Software

Junos Continuity software enables the routers to support new hardware without upgrading Junos OS. Support for new hardware depends on the Junos Continuity package that is installed on the router.

[Table 4 on page 6](#) lists the Junos Continuity software package name, the corresponding Junos OS release, and the list of hardware components that Junos Continuity software support.

**Table 4: Junos Continuity Package Version, Supported Junos OS Release, and the Supported Hardware**

Junos Continuity Package Name	Junos OS Release	Supported Hardware	Description
jam-mpc-2e-3e-ng64	Junos OS Release 14.1R4	<ul style="list-style-type: none"> <li>• MPC3E-3D-NG-Q</li> <li>• MPC3E-3D-NG</li> <li>• MPC2E-3D-NG-Q</li> <li>• MPC2E-3D-NG</li> </ul>	Junos Continuity software package for 64-bit Junos OS.
jam-mpc-2e-3e-ng	Junos OS Release 14.1R4	<ul style="list-style-type: none"> <li>• MPC3E-3D-NG-Q</li> <li>• MPC3E-3D-NG</li> <li>• MPC2E-3D-NG-Q</li> <li>• MPC2E-3D-NG</li> </ul>	Junos Continuity software package for 32-bit Junos OS.
jam-mpc-2e-3e-ng64	Junos OS Release 14.3R3	<ul style="list-style-type: none"> <li>• MPC3E-3D-NG-Q</li> <li>• MPC3E-3D-NG</li> <li>• MPC2E-3D-NG-Q</li> <li>• MPC2E-3D-NG</li> </ul>	Junos Continuity software package for 64-bit version of Junos OS.
jam-mpc7-8-9-x86-32-15.1F4.15-C19.tgz	Junos OS Release 15.1F4	MPC7E-MRATE	Junos Continuity software package for 32-bit Junos OS.
jam-mpc7-8-9-x86-64-15.1F4.15-C19.tgz			Junos Continuity software package for 64-bit Junos OS.
junos-install-jam-mx-x86-32-15.1F4.15-N19.tgz			Junos Continuity software package bundled with Junos OS for 32-bit Junos OS
junos-install-jam-mx-x86-64-15.1F4.15-N19.tgz			Junos Continuity software package bundled with Junos OS for 64-bit Junos OS
jam-mpc7-8-9-x86-32-15.1F5.15-C112.tgz	Junos OS Release 15.1F5	MPC7E-MRATE	Junos Continuity software package for 32-bit Junos OS.
jam-mpc7-8-9-x86-64-15.1F5.15-C112.tgz		MPC8E	
		MPC9E	Junos Continuity software package for 64-bit Junos OS.
junos-install-jam-mx-x86-32-15.1F5.15-N112.tgz		MIC-MRATE	
		SFB2	Junos Continuity software package bundled with Junos OS for 32-bit Junos OS
junos-install-jam-mx-x86-64-15.1F5.15-N112.tgz		MPC7E-10G	Junos Continuity software package bundled with Junos OS for 64-bit Junos OS

- Related Documentation**
- [Junos Continuity Software Overview on page 3](#)
  - [Pathfinder: Hardware Supported by Junos Continuity Software](#)

## CHAPTER 2

# Using Junos Continuity Software to Upgrade Line Cards

- [Line Card Upgrade Using Junos Continuity Software Overview on page 7](#)

## Line Card Upgrade Using Junos Continuity Software Overview

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You can deploy new line cards on a router by installing Junos Continuity software, a software package that enables a router to support new hardware. With Junos Continuity, you can deploy new line cards without the need to upgrade Junos OS. You can just install the Junos Continuity Plug-in and bring the line cards online. Without Junos Continuity, you must upgrade Junos OS to support a new line card. You can bring the new line card online by using the **request chassis fpc slot-number online** command.

Because Junos OS upgrade is not required, this method of upgrading line hardware helps faster deployment of the new line cards and eliminates the time required for software release requalification. To support new hardware, you only need to install the Junos Continuity software package that is specific to the new hardware that you want to install.



**NOTE:** If graceful Routing Engine switchover (GRES) is enabled, you must install the Junos Continuity software package on both the primary and the backup Routing Engines to ensure that the line cards remain operational after a Routing Engine switchover.

### Related Documentation

- [Junos Continuity Software Overview on page 3](#)
- [Installing Junos Continuity Software Package on page 31](#)
- [Junos Continuity Software Package Naming Conventions on page 4](#)
- [Uninstalling Junos Continuity Software Package on page 36](#)

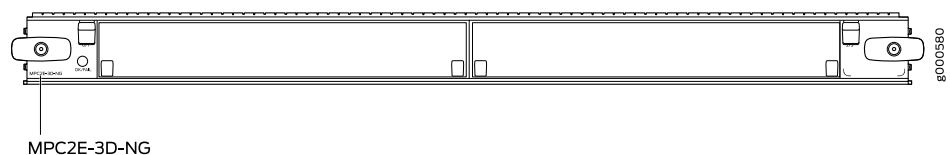


## CHAPTER 3

# Hardware Components Supported by Junos Continuity Software

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- MPC7E (Multi-Rate) on page 17
- MPC7E 10G on page 18
- MPC8E on page 20
- MPC9E on page 22
- MX2000 Enhanced Switch Fabric Board (SFB2) on page 23
- MIC MRATE on page 25

## MPC2E NG



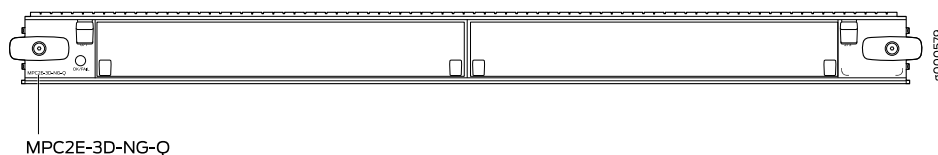
Software release	<ul style="list-style-type: none"><li>• Junos OS releases 14.1R4, 14.2R3 and Junos Continuity, Junos OS release 15.1 and later.</li><li>• Refer to <i>MIC/MPC Compatibility</i> for information about which MICs are supported on this MPC.</li><li>• Refer to the JTAC Knowledgebase article <a href="https://kb.juniper.net/KB21476">https://kb.juniper.net/KB21476</a> for recommended software releases.</li></ul>
Description	<ul style="list-style-type: none"><li>• 80 Gbps capacity without hierarchical quality of service (HQoS)</li><li>• Requires high-capacity fan trays and high-capacity filter trays</li><li>• Weight: 15.96 lb (7.26 kg)</li><li>• Model numbers: MPC2E-3D-NG</li><li>• Name in the CLI: <b>MPC2E NG PQ &amp; Flex Q</b></li><li>• Add-on license provides limited additional flexible queuing.</li></ul> <p><b>NOTE:</b> MPC2E-3D-NG is not compatible with SCB, you must use either SCBE-MX or SCBE2-MX for the switch fabric interface.</p>

Hardware features	<ul style="list-style-type: none"> <li>Line-rate throughput of up to 80 Gbps</li> <li>Supports WAN-PHY mode at 9.95 Gbps and LAN-PHY mode at 10.31 Gbps</li> <li>Two slots for MICs</li> <li>Junos Trio chipsets for increased scaling for bandwidth, subscribers, and services.</li> </ul> <p><b>NOTE:</b> MPC2E-3D-NG is not compatible with SCB, you must use either SCBE-MX or SCBE2-MX for the switch fabric interface.</p> <p><b>NOTE:</b> MPC2E-3D-NG does not support MIC3-3D-10XGE-SFPP, MIC3-3D-1X100GE-CFP, MIC3-3D-1X100GE-CXP, and MIC3-3D-2X40GE-QSFPP.</p> <p><b>NOTE:</b> The non-HQOS MPC3E NG and MPC2E NG MPCs support MIC-3D-8CHOC3-4CHOC12 and MIC-3D-4CHOC3-2CHOC12 only with a limited queuing license.</p>
Software features	<ul style="list-style-type: none"> <li>Chained composite next hops</li> <li>Layer 3 VPN localization</li> <li>Detection of Layer 2 loops</li> <li>Entropy label support in mixed mode</li> <li>SNMP and CLI support for Routing Engine memory monitoring</li> <li>Mixed-mode LAG support on core interfaces</li> <li>Dynamic power management for MICs</li> <li>Support for flexible-queuing</li> <li>See <i>Protocols and Applications Supported by the MX240, MX480, MX960, MX2010, and MX2020 MPC2E</i> for information about the protocols and applications that this MPC supports.</li> </ul>
Power requirement	<p>Maximum with highest-power MICs at 55° C: 9.88 A @ 48 V (474 W)</p> <p>At different temperatures:</p> <ul style="list-style-type: none"> <li>55° C: 474 W</li> <li>40° C: 417 W</li> <li>25° C: 400 W</li> </ul>
LEDs	<p><b>OK/FAIL LED, one bicolor:</b></p> <ul style="list-style-type: none"> <li>Steady green—MPC is functioning normally.</li> <li>Blinking green—MPC is transitioning online or offline.</li> <li>Red—MPC has failed.</li> </ul>



- Related Documentation**
- *MX Series MPC Overview*
  - *MPCs Supported by MX Series Routers*
  - [Junos Continuity Software](#)

## MPC2E NG Q



Software release	<ul style="list-style-type: none"> <li>• Junos OS releases 14.1R4, 14.2R3 and Junos Continuity, Junos OS release 15.1 and later.</li> <li>• Refer to <i>MIC/MPC Compatibility</i> for information about which MICs are supported on this MPC.</li> <li>• Refer to the JTAC Knowledgebase article <a href="https://kb.juniper.net/KB21476">https://kb.juniper.net/KB21476</a> for recommended software releases.</li> </ul>
Description	<ul style="list-style-type: none"> <li>• 80 Gbps capacity with hierarchical quality of service (HQoS)</li> <li>• Requires high-capacity fan trays and high capacity filter trays</li> <li>• Weight: 15.96 lb (7.26 kg)</li> <li>• Model number: MPC2E-3D-NG-Q</li> <li>• Name in the CLI: <b>MPC2E NG HQoS</b></li> </ul> <p><b>NOTE:</b> MPC2E-3D-NG-Q is not compatible with SCB, you must use either SCBE-MX or SCBE2-MX for the switch fabric interface.</p>
Hardware features	<ul style="list-style-type: none"> <li>• Line-rate throughput of up to 80 Gbps</li> <li>• Supports up to 512,000 queues per slot</li> <li>• Supports WAN-PHY mode at 9.95 Gbps and LAN-PHY mode at 10.31 Gbps</li> <li>• Two slots for MICs</li> <li>• Junos Trio chipsets for increased scaling for bandwidth, subscribers, and services.</li> </ul> <p><b>NOTE:</b> The MPC2E-3D-NG-Q has only one lookup chip (LU).</p> <p><b>NOTE:</b> MPC2E-3D-NG-Q does not support MIC3-3D-10XGE-SFPP, MIC3-3D-1X100GE-CFP, MIC3-3D-1X100GE-CXP, and MIC3-3D-2X40GE-QSFPP.</p>
Software features	<ul style="list-style-type: none"> <li>• Chained composite next hops</li> <li>• Layer 3 VPN localization</li> <li>• Detection of Layer 2 loops</li> <li>• Entropy label support in mixed mode</li> <li>• SNMP and CLI support for Routing Engine memory monitoring</li> <li>• BFD support for inline MLPPP/MLFR</li> <li>• Mixed Mode LAG support on core interfaces</li> <li>• Dynamic power management for MICs</li> <li>• See <i>Protocols and Applications Supported by the MX240, MX480, MX960, MX2010, and MX2020 MPC2E</i> for information about the protocols and applications that this MPC supports.</li> </ul>

Power requirement      Maximum with highest-power MICs at 55° C: 11.02 A @ 48 V (529 W)

At different temperatures:

- 55° C: 529 W
- 40° C: 460 W
- 25° C: 438 W

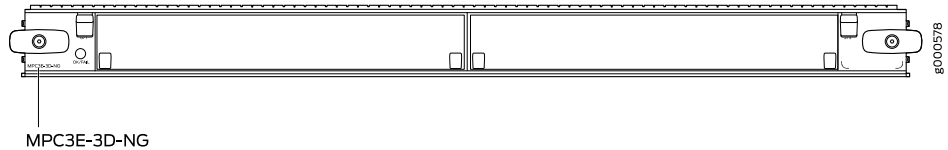
LEDs

**OK/FAIL** LED, one bicolor:

- Steady green—MPC is functioning normally.
- Blinking green—MPC is transitioning online or offline.
- Red—MPC has failed.

- Related Documentation**
- *MX Series MPC Overview*
  - *MPCs Supported by MX Series Routers*
  - [Junos Continuity Software](#)

## MPC3E NG



Software release	<ul style="list-style-type: none"> <li>• Junos OS releases 14.1R4, 14.2R3 and Junos Continuity, Junos OS release 15.1 and later.</li> <li>• Refer to <i>MIC/MPC Compatibility</i> for information about which MICs are supported on this MPC.</li> <li>• Refer to the JTAC Knowledgebase article <a href="https://kb.juniper.net/KB21476">https://kb.juniper.net/KB21476</a> for recommended software releases.</li> </ul>
Description	<ul style="list-style-type: none"> <li>• 130 Gbps capacity without hierarchical quality of service (HQoS)</li> <li>• Requires high-capacity fan trays and high-capacity filter trays</li> <li>• Weight: 15.96 lb (7.26 kg)</li> <li>• Model number: MPC3E-3D-NG</li> <li>• Name in the CLI: <b>MPC3E NG PQ &amp; Flex Q</b></li> <li>• Add-on license provides limited additional flexible queuing.</li> </ul> <p><b>NOTE:</b> MPC3E-3D-NG is not compatible with SCB, you must use either SCBE-MX or SCBE2-MX for the switch fabric interface.</p>
Hardware features	<ul style="list-style-type: none"> <li>• Line-rate throughput of up to 130 Gbps</li> <li>• Supports WAN-PHY mode at 9.95 Gbps and LAN-PHY mode at 10.31 Gbps</li> <li>• Supports maximum transmission unit (MTU) size of 9,192 bytes for host bound packets. For Junos OS 16.1R1 and later releases, the MTU size supported is 9,500 bytes.</li> <li>• Two slots for MICs</li> <li>• Junos Trio chipsets for increased scaling for bandwidth, subscribers, and services</li> </ul> <p><b>NOTE:</b> The non-HQOS MPC3E NG and MPC2E NG MPCs support MIC-3D-8CHOC3-4CHOC12 and MIC-3D-4CHOC3-2CHOC12 only with a limited queuing license.</p>
Software features	<ul style="list-style-type: none"> <li>• Chained composite next hops</li> <li>• Layer 3 VPN localization</li> <li>• Detection of Layer 2 loops</li> <li>• Entropy label support in mixed mode</li> <li>• SNMP and CLI support for Routing Engine memory monitoring</li> <li>• Mixed Mode LAG support on core interfaces</li> <li>• Dynamic power management for MICs</li> <li>• Support for flexible-queuing</li> <li>• See <i>Protocols and Applications Supported by the MPC3E on MX Series Routers</i> for information about the protocols and applications that this MPC supports.</li> </ul>

Power requirement      Maximum with highest-power MICs at 55° C: 11.13 A @ 48 V (534 W)

At different temperatures:

- 55° C: 534 W
- 40° C: 485 W
- 25° C: 461 W

LEDs

**OK/FAIL LED**, one bicolor:

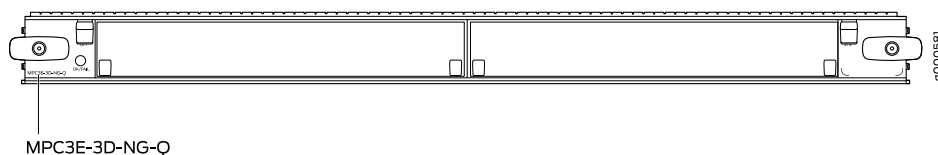
- Steady green—MPC is functioning normally.
- Blinking green—MPC is transitioning online or offline.
- Red—MPC has failed.



**NOTE:** On the MX960 router, FPC slot 0 and slot 11 are not NEBS compliant beyond 104°F (40°C) with MPC3E-3D-NG and MPC3E-3D-NG-Q. This is a cooling restriction.

- Related Documentation**
- *MX Series MPC Overview*
  - *MPCs Supported by MX Series Routers*
  - [Junos Continuity Software](#)

## MPC3E NG Q



Software release	<ul style="list-style-type: none"> <li>• Junos OS releases 14.1R4, 14.2R3 and Junos Continuity, Junos OS release 15.1 and later.</li> <li>• Refer to <i>MIC/MPC Compatibility</i> for information about which MICs are supported on this MPC.</li> <li>• Refer to the JTAC Knowledgebase article <a href="https://kb.juniper.net/KB21476">https://kb.juniper.net/KB21476</a> for recommended software releases.</li> </ul>
Description	<ul style="list-style-type: none"> <li>• 130 Gbps capacity with hierarchical quality of service (HQoS)</li> <li>• Requires high-capacity fan trays and high-capacity filter trays</li> <li>• Weight: 15.96 lb (7.26 kg)</li> <li>• Model number: MPC3E-3D-NG-Q</li> <li>• Name in the CLI: <b>MPC3E NG HQoS</b></li> </ul> <p><b>NOTE:</b> MPC3E-3D-NG-Q is not compatible with SCB, you must use either SCBE-MX or SCBE2-MX for the switch fabric interface.</p>
Hardware features	<ul style="list-style-type: none"> <li>• Line-rate throughput of up to 130 Gbps</li> <li>• Supports up to 512,000 queues per slot</li> <li>• Supports WAN-PHY mode at 9.95 Gbps and LAN-PHY mode at 10.31 Gbps</li> <li>• Supports maximum transmission unit (MTU) size of 9,192 bytes for host bound packets. For Junos OS 16.1R1 and later releases, the MTU size supported is 9,500 bytes.</li> <li>• Two slots for MICs</li> <li>• Junos Trio chipsets for increased scaling for bandwidth, subscribers, and services</li> </ul>
Software features	<ul style="list-style-type: none"> <li>• Chained composite next hops</li> <li>• Layer 3 VPN localization</li> <li>• Detection of Layer 2 loops</li> <li>• Entropy label support in mixed mode</li> <li>• SNMP and CLI support for Routing Engine memory monitoring</li> <li>• BFD support for inline MLPPP/MLFR</li> <li>• Mixed Mode LAG support on core interfaces</li> <li>• Dynamic power management for MICs</li> <li>• See <i>Protocols and Applications Supported by the MPC3E on MX Series Routers</i> for information about the protocols and applications that this MPC supports.</li> <li>• See <i>MPC3E on MX Series Routers Overview</i> for additional information.</li> </ul>

Power requirement      Maximum with highest-power MICs at 55° C: 12.15 A @ 48 V (583 W)

At different temperatures:

- 55° C: 583 W
- 40° C: 532 W
- 25° C: 503 W

LEDs

**OK/FAIL** LED, one bicolor:

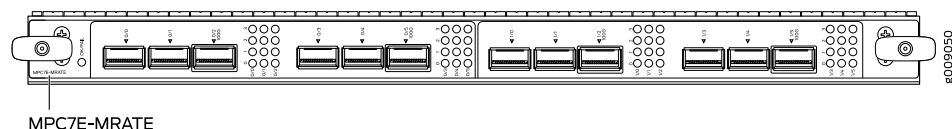
- Steady green—MPC is functioning normally.
- Blinking green—MPC is transitioning online or offline.
- Red—MPC has failed.



**NOTE:** On the MX960 router, FPC slot 0 and slot 11 are not NEBS compliant beyond 104°F (40°C) with MPC3E-3D-NG and MPC3E-3D-NG-Q. This is a cooling restriction.

- Related Documentation**
- [MX Series MPC Overview](#)
  - [MPCs Supported by MX Series Routers](#)
  - [Junos Continuity Software](#)

## MPC7E (Multi-Rate)



Software release	<ul style="list-style-type: none"> <li>• Junos OS Release 15.1F4 with Junos Continuity.</li> <li>• Junos OS Release 15.1F6 and later.</li> <li>• Junos OS release 16.1R1 and later.</li> </ul>
Description	<ul style="list-style-type: none"> <li>• Fixed-configuration MPC with 10-Gbps, 40-Gbps, and 100-Gbps port speeds</li> <li>• Weight: 15.7 lb (7.12 kg)</li> <li>• Model number: MPC7E-MRATE</li> <li>• Name in the CLI: <b>MPC7E-MRATE</b></li> </ul>
Hardware features	<ul style="list-style-type: none"> <li>• Line-rate throughput of up to 480 Gbps on MX240, MX480, and MX960 routers.</li> <li>• Line-rate throughput of up to 400 Gbps on MX2000 routers with SFB, and up to 430 Gbps on MX2000 routers with SFB2.</li> <li>• Junos Trio chipsets for increased scaling for bandwidth, subscribers, and services</li> <li>• Twelve Gigabit Ethernet ports that can be configured as 40-Gigabit Ethernet port or as 4 10-Gigabit Ethernet port using a breakout cable. The ports support quad small-form factor pluggable plus (QSFP+) transceivers.</li> <li>• Four out of the twelve ports can be configured as 100-Gigabit Ethernet ports. Port numbers <b>0/2</b>, <b>0/5</b>, <b>1/2</b> and <b>1/5</b> are the four 100-Gigabit Ethernet ports.</li> <li>• You can configure different combination of port speeds as long as the aggregate capacity per group of six ports labeled <b>0/0</b> through <b>0/5</b> does not exceed 240 Gbps. Similarly, aggregate capacity per group of the other six ports labeled <b>1/0</b> through <b>1/5</b> should not exceed 240 Gbps.</li> <li>• Requires high-capacity power supplies, high-capacity fan trays, and SCBE2 on MX240, MX480, and MX960 routers.</li> <li>• Requires an adapter card to be housed in MX2000 routers.</li> <li>• The ports are labeled as (with the MPC orientation as shown in the above figure): <ul style="list-style-type: none"> <li>• 10-Gigabit Ethernet or 40-Gigabit Ethernet ports: <b>0/0</b>, <b>0/1</b>, <b>0/2 100G</b>, <b>0/3</b>, <b>0/4</b>, <b>0/5 100G</b>, <b>1/0</b>, <b>1/1</b>, <b>1/2 100G</b>, <b>1/3</b>, <b>1/4</b>, and <b>1/5 100G</b></li> <li>• 100-Gigabit Ethernet ports: <b>0/2 100G</b>, <b>0/5 100G</b>, <b>1/2 100G</b> and <b>1/5 100G</b></li> </ul> </li> </ul> <p><b>NOTE:</b> Only ports marked <b>100G</b> support 100-Gigabit Ethernet speed using QSFP28 transceivers.</p> <ul style="list-style-type: none"> <li>• Supports maximum transmission units (MTUs) from 256 bytes through 16,000 bytes for transit traffic, and from 256 bytes through 9,500 bytes for host bound packets.</li> </ul> <p><b>NOTE:</b> On MX960 routers, all the MPC slots can be occupied by MPC7E (Multi-Rate) at an ambient temperature of up to 40° C and at any altitude. All the MPC slots can be occupied by MPC7E (Multi-Rate) at temperatures of up to 55° C and at sea level. At an ambient temperature of 55° C and above, and at an altitude above sea level, slot 11 cannot host MPC7E (Multi-Rate).</p>

**Software features**

- Supports rate selectability at the port level.
- By default, the ports are configured as 10-Gigabit Ethernet ports.
- Optical diagnostics and related alarms
- See *Protocols and Applications Supported by the MPC7E for MX Series Routers* for information about the protocols and applications that the MPC7E supports.

**NOTE:** On MX240, MX480, and MX960 routers, MPC7E powers on only if the **network-services** mode on the router is configured as either **enhanced-ip** or **enhanced-ethernet**. On MX2000 router no additional configuration is required as by default the router operates in **enhanced-ip** mode.

**Cables and connectors**

**TIP:** You can use the [Hardware Compatibility Tool](#) to find information about the pluggable transceivers supported on your Juniper Networks device.

The list of supported transceivers for the MX Series is located at <https://pathfinder.juniper.net/hct/category/#catKey=100001&modelType;=All&pf;=MX+Series>.

**Power requirements**

- At different temperatures:  
55° C: 545 W  
40° C: 465 W  
25° C: 440 W

**LEDs**

**OK/FAIL LED**, one bicolor:

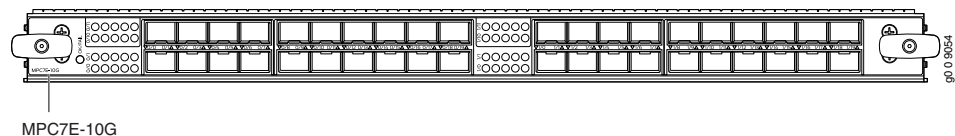
- Steady green—MPC is functioning normally.
- Yellow—MPC has failed.

**LINK LED**, one green per port (4 per QSFP+ cage):

- Steady green—Link is up.
- Off—Link is down or disabled.

**Related Documentation**

- *MPC7E (Multi-Rate) on MX Series Routers Overview*
- *MX Series MPC Overview*
- *MPCs Supported by MX Series Routers*
- *Junos Continuity Software User Guide (Junos OS Release 14.1R4 and Later Releases)*

**MPC7E 10G****Software release**

- Junos OS Release 15.1F5 with Junos Continuity
- Junos OS release 16.1R1 and later



Description	<ul style="list-style-type: none"> <li>Fixed-configuration MPC with forty 10-Gbps ports</li> <li>Weight: 17 lb (7.7 kg)</li> <li>Model number: MPC7E-10G</li> <li>Name in the CLI: <b>MPC7E 3D 40XGE</b></li> </ul>
Hardware features	<ul style="list-style-type: none"> <li>Line-rate throughput of up to 400 Gbps on MX240, MX480, and MX960 routers.</li> <li>Line-rate throughput of up to 400 Gbps on MX2000 routers.</li> <li>Junos Trio chipsets for increased scaling for bandwidth, subscribers, and services.</li> <li>Forty 10-Gigabit Ethernet ports. The ports support SFP+ transceivers.</li> <li>Requires high-capacity power supplies, high-capacity fan trays, and SCBE2 on MX240, MX480, and MX960 routers.</li> <li>Requires an adapter card to be housed in MX2000 routers.</li> <li>Supports maximum transmission units (MTUs) from 256 bytes through 16,000 bytes for transit traffic, and from 256 bytes through 9,500 bytes for host bound packets.</li> <li>The ports are labeled as (with the MPC orientation as shown in the figure): <ul style="list-style-type: none"> <li><b>0/0</b> through <b>0/9</b></li> <li><b>0/10</b> through <b>0/19</b></li> <li><b>1/0</b> through <b>1/9</b></li> <li><b>1/10</b> through <b>1/19</b></li> </ul> </li> </ul>
Software features	<ul style="list-style-type: none"> <li>Supports MACsec using the following encryption algorithms: gcm-aes-128 and gcm-aes-256.</li> <li>Supports <b>Hyper mode</b> to speed up packet processing.</li> <li>Supports <b>Flexible queuing</b> using an add-on license to support 32,000 queues per line card, including queues on both ingress and egress interfaces. You can use an additional license to support up to 512,000 queues.</li> <li>Optical diagnostics and related alarms</li> <li>See <i>Protocols and Applications Supported by the MPC7E for MX Series Routers</i> for information about the protocols and applications that MPC7Es support.</li> </ul> <p><b>NOTE:</b> On MX240, MX480, and MX960 routers, MPC7E powers on only if the <b>network-services</b> mode on the router is configured as either <b>enhanced-ip</b> or <b>enhanced-ethernet</b>. On MX2000 routers, no additional configuration is required because by default the router operates in <b>enhanced-ip</b> mode.</p>
Cables and connectors	<p><b>TIP:</b> You can use the <a href="#">Hardware Compatibility Tool</a> to find information about the pluggable transceivers supported on your Juniper Networks device.</p> <p>The list of supported transceivers for the MX Series is located at <a href="https://pathfinder.juniper.net/hct/category/#catKey=100001&amp;modelType;=All&amp;pf;=MX+Series">https://pathfinder.juniper.net/hct/category/#catKey=100001&amp;modelType;=All&amp;pf;=MX+Series</a>.</p> <ul style="list-style-type: none"> <li>10GBASE-ZR (model number: SFPP-10G-ZR-OTN-XT) <p><b>NOTE:</b> MPC7E 10G does not support OTN rates.</p> </li> <li>10GBASE-ZR (model number: SFPP-10G-DT-ZRC2) <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>Supported from Junos OS release 16.1R1 and later.</li> <li>Supports 40° C ambient temperature operation at any altitude, and 55° C ambient temperature operation at sea level.</li> </ul> </li> </ul>

## Power requirements

- Typical: 405 W
- At different temperatures:
  - 55° C: 500 W
  - 40° C: 465 W
  - 25° C: 430 W

**NOTE:** On MX960 routers, all the MPC slots can be occupied by MPC7E 10G at an ambient temperature of up to 40° C and at any altitude. All the MPC slots can be occupied by MPC7E 10G at temperatures of up to 55° C and at sea level. At an ambient temperature of 55° C and above, and at an altitude above sea level, slot 11 cannot host MPC7E 10G.

## LEDs

**OK/FAIL LED**, one bicolor:

- Steady green—MPC is functioning normally.
- Yellow—MPC has failed.

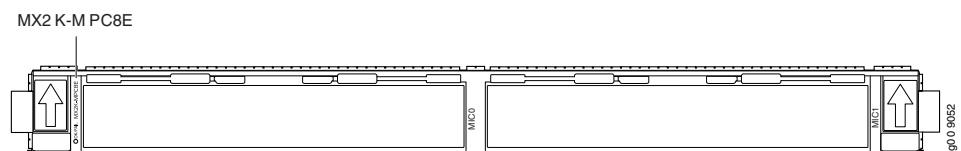
**Link LED**, one green per port:

- Steady green—Link is up.
- Off—Link is down or disabled.

### Related Documentation

- *MPC7E 10G on MX Series Routers Overview*
- *MX Series MPC Overview*
- *MPCs Supported by MX Series Routers*
- *Junos Continuity Software User Guide (Junos OS Release 14.1R4 and Later Releases)*

## MPC8E



## Software release

- Junos OS Release 15.1F5 with Junos Continuity
- Junos OS release 16.1R1 and later

## Description

- Weight: 31.4 lb (14.24 kg) (net weight without blank panels)
- Model number: MX2K-MPC8E
- Name in the CLI: **MPC8E 3D**

## Hardware features

- Line-rate throughput of up to 960 Gbps on the MX2000 routers.
- Line-rate throughput of up to 1600 Gbps (1.6 Tbps) on the MX2000 routers with software upgrade.  
**NOTE:** Starting from Junos OS Release 16.1R1, you can upgrade MPC8E to provide an increased bandwidth of 1600 Gbps (1.6 Tbps) by using an add-on license. After you perform the upgrade, MPC8E provides a bandwidth of 1.6 Tbps, which is equivalent to the bandwidth of "MPC9E" on page 22. However, the MPC continues to be identified as MPC8E.
- Four Packet Forwarding Engines, each providing a maximum bandwidth of 240 Gbps in normal mode and 400 Gbps in 1.6Tbps upgraded mode. A license is required to operate in 1.6 Tbps upgraded mode.
- Supports two MICs. For information about which MICs are supported on this MPC, see *MIC/MPC Compatibility*.
- Junos Trio chipsets for increased scaling for bandwidth, subscribers, and services.
- Supports the Switch Fabric Boards SFB and SFB2. When MPC8E is used with SFB, the line-rate throughput is limited to 800 Gbps.
- Supports maximum transmission units (MTUs) from 256 bytes through 16,000 bytes for transit traffic, and from 256 bytes through 9,500 bytes for host bound packets.

## Software features

- **Dynamic power management** for effective utilization of available power.
- **Inline flow monitoring** for higher scalability and performance.
- **Flexible queuing** using an add-on license to support 32,000 queues per line card, including queues on both ingress and egress interfaces. You can use an additional license to support up to 512,000 queues per slot or 1,000,000 queues per slot.
- **Hyper mode** to speed up packet processing.
- Optical diagnostics and related alarms.

For more information about features supported on MPC8E, see *Protocols and Applications Supported by the MPC8E and MPC9E on the MX2010 and MX2020 Routers*.

## Power requirements

Normal mode with line-rate throughput of 960 Gbps:

(without MICs)

- Typical: 688 W
- At different temperatures:  
55° C: 805 W  
40° C: 720 W  
25° C: 690 W

Upgrade mode with line-rate throughput of 1.6 Tbps:

- Typical: 838 W
- At different temperatures:  
55° C: 1018 W  
40° C: 870 W  
25° C: 840 W

## LEDs

OK/FAIL LED, one bicolor:

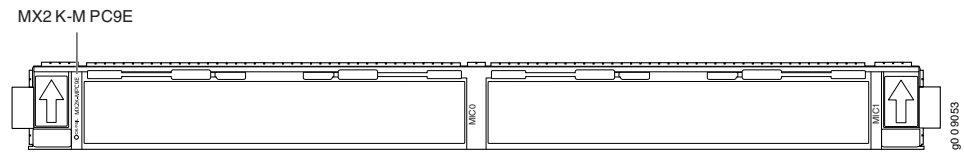
- Steady green—MPC is functioning normally.
- Yellow—MPC has failed.

### Related Documentation

- *MPC8E on MX Series Routers Overview*
- *MX Series MPC Overview*
- *MPCs Supported by MX Series Routers*
- *Junos Continuity Software User Guide (Junos OS Release 14.1R4 and Later Releases)*

- *Understanding Rate Selectability*

## MPC9E



Software release	<ul style="list-style-type: none"> <li>• Junos OS Release 15.1F5 with Junos Continuity</li> <li>• Junos OS release 16.1R1 and later</li> </ul>
Description	<ul style="list-style-type: none"> <li>• Weight: 31.4 lb (14.24 kg) (net weight without blank panels)</li> <li>• Model number: MX2K-MPC9E</li> <li>• Name in the CLI: <b>MPC9E 3D</b></li> </ul>
Hardware features	<ul style="list-style-type: none"> <li>• Line-rate throughput of up to 1600 Gbps (1.6 Tbps) on MX2000 routers.</li> <li>• Four Packet Forwarding Engines, each providing a maximum bandwidth of 400 Gbps.</li> <li>• Supports two MICs. For information about which MICs are supported on this MPC, see <i>MIC/MPC Compatibility</i>.</li> <li>• Junos Trio chipsets for increased scaling for bandwidth, subscribers, and services</li> <li>• Supports the Switch Fabric Boards SFB and SFB2. When MPC9E is used with SFB, the line-rate throughput is limited to 800 Gbps.</li> <li>• Supports maximum transmission units (MTUs) from 256 bytes through 16,000 bytes for transit traffic, and from 256 bytes through 9,500 bytes for host bound packets.</li> </ul>
Software features	<ul style="list-style-type: none"> <li>• <i>Dynamic Power Management</i> for effective utilization of available power.</li> <li>• <i>Inline Active Flow Monitoring</i> for higher scalability and performance.</li> <li>• <i>Flexible Queuing Mode</i> using an add-on license to support 32,000 queues per line card, including queues on both ingress and egress interfaces. You can use an additional license to support up to 512,000 queues per slot or 1,000,000 queues per slot.</li> <li>• <i>Hyper Mode</i> to speed up packet processing.</li> <li>• Optical diagnostics and related alarms.</li> </ul> <p>For more information about features supported on MPC9E, see <i>Protocols and Applications Supported by the MPC8E and MPC9E on the MX2010 and MX2020 Routers</i>.</p>
Power requirements (without MICs)	<ul style="list-style-type: none"> <li>• Typical: 838 W</li> <li>• At different temperatures: <ul style="list-style-type: none"> <li>55° C: 1018 W</li> <li>40° C: 870 W</li> <li>25° C: 840 W</li> </ul> </li> </ul>
LEDs	<p><b>OK/FAIL LED</b>, one bicolor:</p> <ul style="list-style-type: none"> <li>• Steady green—MPC is functioning normally.</li> <li>• Yellow—MPC has failed.</li> </ul>

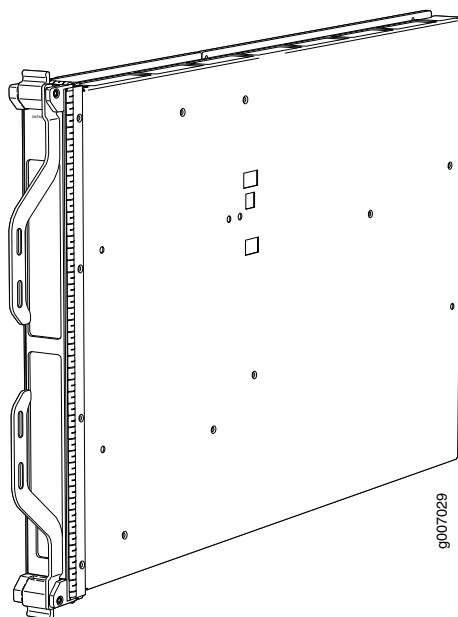
**Related Documentation** • *MPC9E on MX Series Routers Overview*

- *MX Series MPC Overview*
- *MPCs Supported by MX Series Routers*
- *Junos Continuity Software User Guide (Junos OS Release 14.1R4 and Later Releases)*
- *Understanding Rate Selectability*

## MX2000 Enhanced Switch Fabric Board (SFB2)

The MX2000 Switch Fabric Board (SFB) straddles the two backplanes. It has connectors connecting to both backplanes, (see [Figure 1 on page 23](#)). The SFB and SFB2 are exactly the same except that the SFB2 has two PF fabric chips per card whereas SFB has three XF fabric chips per card.

*Figure 1: Enhanced Switch Fabric Board*



### Software release

- Junos OS Release 11.4 and later
- Name in CLI: **Switch Fabric Board**

### Description

The MX2000 Enhanced Switch Fabric Board (SFB2; model number: MX2000-SFB2-S) provides increased fabric bandwidth per slot. MX2000 line of routers can support eight Switch Fabric Boards (SFB) and eight Enhanced Switch Fabric Boards (SFB2) but not both at the same time. The SFB2 is supported on MX2010 and MX2020 routers. Refer to [Figure 1 on page 23](#).

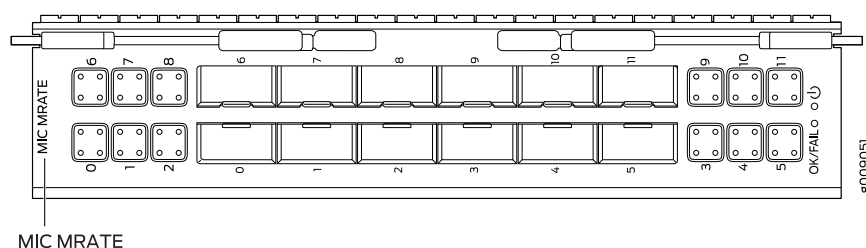
**NOTE:** During an upgrade from SFB to SFB2, the MX2000 line of routers support both SFB and SFB2 at the same time for the duration of the upgrade.

SFB2 Features and Components	<ul style="list-style-type: none"> <li>• PCIe control of two PF ASICs</li> <li>• I2C bus logic interface, used for component management and monitoring of temperature, and voltage</li> <li>• Switch fabric—Provides switching functions for the MPCs</li> <li>• Fabric capacity—Supports 2 Tbps per slot with eight SFB2 and 1.7 Tbps per slot with seven SFB2</li> <li>• Circuits for chassis management and control</li> <li>• Power circuits for the SFB2</li> <li>• LED—Provides status of the SFB2</li> </ul>
SFB2 Slots	<p>You can install up to eight SFB2s in the MX2000 router. The SFB2s install vertically into the front of the chassis in the slots labeled 0 through 7. If any slots are empty, you must install a blank panel.</p> <p><b>CAUTION:</b> If one of the SFB2s fails, do not remove the failed SFB2 until you have a replacement or blank panel to install.</p>
SFB2 Redundancy	<p>Seven of eight SFB2s are required for line rate operation. The system can continue operating with fewer than seven SFB2s, but forwarding performance will be impacted.</p>
Weight and Dimensions	<ul style="list-style-type: none"> <li>• Weight: 16 lb (7.2 kg)</li> <li>• Width: 1.7 in. (4.31 cm)</li> <li>• Depth: 23.6 in. (59.94 cm). With ejector handle: 26.14 in. (66.39 cm)</li> <li>• Height: 16.225 in. (41.21 cm)</li> </ul>
Maximum Power Requirements (without MICs)	<p>MX2020:</p> <ul style="list-style-type: none"> <li>• Typical: 250 W</li> <li>• At different temperatures: <ul style="list-style-type: none"> <li>295 W at 55° C</li> <li>280 W at 40° C</li> <li>270 W at 25° C</li> </ul> </li> </ul> <p>MX2010:</p> <ul style="list-style-type: none"> <li>• Typical: 220 W</li> <li>• At different temperatures: <ul style="list-style-type: none"> <li>265 W at 55° C</li> <li>250 W at 40° C</li> <li>240 W at 25° C</li> </ul> </li> </ul>
LEDs	<p><b>OK/FAIL LED</b>, one bicolor:</p> <ul style="list-style-type: none"> <li>• Steady green—SFB2 is online and functioning normally.</li> <li>• Slow blinking green—SFB2 is initializing.</li> <li>• Fast blinking green—SFB2 is being identified by software.</li> </ul> <p><b>NOTE:</b> This is used to guide the operator to correct any action needed on the SFB2.</p> <ul style="list-style-type: none"> <li>• Red—SFB2 has failed.</li> <li>• Off—SFB2 is offline.</li> </ul> <p>Each SFB2 also has a set of bicolor LEDs on the craft interface that indicate its status. The SFB2 LEDs, labeled 0 through 7, are located along the bottom center of the craft interface. For more information about the SFB2 LED on the craft interface, see <i>MX2000 Switch Fabric Board LED</i></p>

- Related Documentation**
- *MX2000 Switch Fabric Board LED*
  - *MX2000 Host Subsystem CB-RE Description*
  - *Replacing an MX2000 SFB*
  - *Understanding Fabric Fault Handling on Enhanced Switch Fabric Board (SFB2)*
  - *Performing a Smooth Upgrade to Enhanced Switch Fabric Board (SFB2) with Minimal Impact on Traffic*

## MIC MRATE

**Figure 2: 12-Port Multi-Rate MIC with QSFP+**



- Software release**
- Junos OS Release 15.1F5 with Junos Continuity
  - Junos OS release 16.1R1 and later

For information about which MPCs support this MIC, see *MIC/MPC Compatibility*. For information about which MICs are supported on MX Series routers, see *MICs Supported by MX Series Routers*.

- Description**
- Twelve Gigabit Ethernet ports that support quad small form-factor pluggable plus (QSFP+) transceivers
  - Power requirement;
    - When installed into MPC8E: 1.250 A @ 48 V (60 W)
    - When installed into MPC9E, or into MPC8E operating in 1.6 Tbps upgrade mode (licensed feature): 1.771 A @ 48 V (85 W)
  - Weight: 3.9 lb (1.77 kg)
  - Model number: MIC-MRATE
  - Name in the CLI: **MRATE-12xQSFP+XGE-XLGE-CGE**

- Hardware features
- The ports are numbered **0** through **11**.
  - Twelve Gigabit Ethernet QSFP+ ports, each of which can be configured as a 40-Gigabit Ethernet port or as four 10-Gigabit Ethernet ports by using a breakout cable.
  - Eight out of the twelve ports can be configured as 100-Gigabit Ethernet ports. Port numbers **0** through **3**, and **6** through **9** are the eight 100-Gigabit Ethernet ports.
  - When used in MX2K-MP8CE:
    - 4 ports out of the total 12 support 100-Gigabit Ethernet speed
    - Maximum aggregate port capacity across ports **0** through **5** should not exceed 240 Gbps
    - Maximum aggregate port capacity across ports **6** through **11** should not exceed 240 Gbps
  - When used in MX2K-MPC9E:
    - 8 ports out of the total 12 support 100-Gigabit Ethernet speed
    - Maximum aggregate port capacity across ports **0** through **5** should not exceed 400 Gbps
    - Maximum aggregate port capacity across ports **6** through **11** should not exceed 400 Gbps

Table 5 on page 26 lists the configurable Gbps Ethernet port speeds for each port.

Software features	<ul style="list-style-type: none"> <li>• Supports rate selectability at the port level.</li> <li>• By default, the ports are configured as 10-Gigabit Ethernet ports.</li> <li>• Supports remote port identification.</li> </ul>
Cables and connectors	<p><b>TIP:</b> You can use the <a href="#">Hardware Compatibility Tool</a> to find information about the pluggable transceivers supported on your Juniper Networks device.</p> <p>The list of supported transceivers for the MX Series is located at <a href="https://pathfinder.juniper.net/hct/category/#catKey=100001&amp;modelType;=All&amp;pf;=MX+Series">https://pathfinder.juniper.net/hct/category/#catKey=100001&amp;modelType;=All&amp;pf;=MX+Series</a>.</p>
LEDs	<ul style="list-style-type: none"> <li>• <b>OK/FAIL</b> LED, one bicolor:           <ul style="list-style-type: none"> <li>• Steady green—MIC is functioning normally.</li> <li>• Yellow—MIC has failed.</li> </ul> </li> <li>• <b>Link</b> LED, one green per port (4 per QSFP+ cage):           <ul style="list-style-type: none"> <li>• Steady green—Link is up.</li> <li>• Off—Link is down or disabled.</li> </ul> </li> </ul> <p>Each QSFP+ cage contains four LEDs, logically numbered from 0 through 3. These numbers help you identify the corresponding cable when a breakout cable (4x10 Gigabit) is connected to a port. On an installed MRATE MIC, the orientation of these LEDs is as follows: upper left <b>0</b>, upper right <b>1</b>, lower left <b>2</b>, and lower right <b>3</b>.</p>

**Table 5: MIC MRATE Gigabit Ethernet Port Speed Capabilities**

Port #	4x10 Gbps Ethernet	40 Gbps Ethernet	100 Gbps Ethernet
0	yes	yes	yes
1	yes	yes	yes
2	yes	yes	yes
3	yes	yes	yes
4	yes	yes	no



**Table 5: MIC MRATE Gigabit Ethernet Port Speed Capabilities (continued)**

Port #	4x10 Gbps Ethernet	40 Gbps Ethernet	100 Gbps Ethernet
5	yes	yes	no
6	yes	yes	yes
7	yes	yes	yes
8	yes	yes	yes
9	yes	yes	yes
10	yes	yes	no
11	yes	yes	no

**Related Documentation**

- *Junos Continuity Software User Guide (Junos OS Release 14.1R4 and Later Releases)*
- *Understanding Interface Naming Conventions for MIC-MRATE*
- *Understanding Rate Selectability*
- *Configuring Rate Selectability on MIC-MRATE to Enable Different Port Speeds*



## PART 2

# Installation

- [Installing Junos Continuity Software on page 31](#)



# Installing Junos Continuity Software

- Installing Junos Continuity Software Package to Support New Hardware on page 31
- Uninstalling Junos Continuity Software Package on page 36

## Installing Junos Continuity Software Package to Support New Hardware

---

You install the Junos Continuity software package to enable a router to support new hardware without the need to upgrade Junos OS. You can install the Junos Continuity software package as a standalone package or as a package bundled with Junos OS.

If graceful Routing Engine switchover (GRES) is enabled, you must install the Junos Continuity software package on both the primary and the backup Routing Engines to ensure that the hardware components remain operational after a Routing Engine switchover.



**NOTE:** Before you proceed with the installation, verify that the version of Junos OS that is installed on the router supports Junos Continuity software.

You can consider one of the following methods to install Junos Continuity software:

- Install the Standalone Junos Continuity Plug-in—Upgrade of Junos OS is not required. You install the Standalone Junos Continuity Plug-in if the version of Junos OS that is installed on the router supports Junos Continuity software. For example, if the router is running Junos OS Release 15.1F4, you can directly install Standalone Junos Continuity Plug-in and then bring the line cards online.

After you install Junos Continuity software, you can bring the new line card online by using the **request chassis fpc slot-number online** command.

This topic guides you through the installation of the Standalone Junos Continuity Plug-in on 64-bit Junos OS.

- Install the Junos Continuity Plug-in Integrated with Junos OS—Requires you to upgrade Junos OS. You use the integrated package if the version of Junos OS that is installed on the router does not support Junos Continuity software. For example, if you want to install Junos Continuity software on Junos OS Release 13.3, you can use the integrated package that contains both Junos OS Release 15.1F4 and the Junos Continuity Plug-in. This is a one-step process to upgrade Junos OS to Junos OS Release 15.1F4 and also

to install Junos Continuity software. See *Software Installation and Upgrade Guide* for more information about upgrading Junos OS.



**NOTE:** To upgrade the Junos Continuity software package, you can just install the new package on the router. The installed version of Junos Continuity software gets overwritten when you install a later version.

Before you begin installing Junos Continuity software:

1. Download the Junos Continuity software package from <https://www.juniper.net/support/>. For information about downloading software packages, see *Downloading Software*.
2. Install the new line cards by following the procedure given in the router's hardware guide.
3. (Optional) Run the **run show chassis fpc** command to verify the status of the new line cards.

For example, the following sample output displays information about all the line cards installed on the router:

```
[edit]
user@router# run show chassis fpc
```

	Temp	CPU Utilization (%)		CPU Utilization (%)			Memory
		Total	Interrupt	1min	5min	15min	DRAM
Slot State	(C)						
(MB) Heap							
Buffer							
0 Empty							
1 Empty							
2 Empty							
...							
16 Empty							
17 Empty							
18 Empty							
19 Offline		---FPC incompatible with SCB---					

The newly installed line cards are displayed as **FPC incompatible with SCB** because the router cannot recognize them.

## Installing the Junos Continuity Software Package

This section provides the steps to install the Junos Continuity software package.

To install the Junos Continuity software package:

1. Run the **request system software add path/package-name** command to start installation of the Junos Continuity software package on the master Routing Engine. For example, to install the **jam-mpc7-8-9-x86-64-15.1F4.15-C1.9** package:

```
{master}
user@router> request system software add jam-mpc7-8-9-x86-64-15.1F4.15-C1.9.tgz

Verified jam-mpc7-8-9-x86-64-15.1F4.15-C1.9 signed by PackageProductionEc_2015
Installing jam-mpc7-8-9-x86-64-15.1F4.15-C1.9
12ald loaded successfully
clksyncd loaded successfully
dfwd loaded successfully
dcd loaded successfully
cosd loaded successfully
chassisd loaded successfully
chassisd loaded successfully for fabric
WARNING: GRES is enabled on this RE. In order to ensure that the JAM supported
hardware remains operational across GRES switchover, please install JAM package
on the other RE also
jam-mpc7-8-9-x86-64-15.1F4.15-C1.9 has been installed successfully

{master}
user@router>
```



**NOTE:** Juniper Networks recommends that you *do not* use the **validate** option when you install the Junos Continuity software package. If you use the **validate** option, you need to restart the router to activate the Junos Continuity software package.

2. Run the **show version** command to verify the installation.

```
{master}
user@router> show version
Hostname:
Model: mx2020
Junos: 15.1F4.15
JUNOS OS Kernel 64-bit [20151204.318939_builder_stable_10]
JUNOS OS libs [20151204.318939_builder_stable_10]
JUNOS OS runtime [20151204.318939_builder_stable_10]
JUNOS OS time zone information [20151204.318939_builder_stable_10]
JUNOS OS libs compat32 [20151204.318939_builder_stable_10]
JUNOS OS 32-bit compatibility [20151204.318939_builder_stable_10]
JUNOS py base [20151223.164524_builder_junos_151_f4]
JUNOS OS crypto [20151204.318939_builder_stable_10]
JUNOS network stack and utilities [20151223.164524_builder_junos_151_f4]
JUNOS modules [20151223.164524_builder_junos_151_f4]

...

JUNOS Online Documentation [20151223.164524_builder_junos_151_f4]
```

```

JUNOS 64-bit JAM Plugin Software Suite (MPC7E/8E/9E)
[20151224.015503_builder_junos_151_x56_d10]
JUNOS FIPS mode utilities [20151223.164524_builder_junos_151_f4]

{master}

user@router>

```

After Junos Continuity software package is installed successfully, the output of the **show version** command displays **JUNOS 64-bit JAM Plugin Software Suite** among the list of packages that are installed on the router.

3. (Optional) Run the **request system software add path/package-name** command to install Junos Continuity software package on the backup Routing Engine. For example, to install the **jam-mpc7-8-9-x86-64-15.1F4.15-C1.9** package:

```

{backup}
user@router> request system software add jam-mpc7-8-9-x86-64-15.1F4.15-C1.9.tgz

Verified jam-mpc7-8-9-x86-64-15.1F4.15-C1.9 signed by PackageProductionEc_2015
Installing jam-mpc7-8-9-x86-64-15.1F4.15-C1.9
chassisd loaded successfully
chassisd loaded successfully for fabric
WARNING: GRES is enabled on this RE. In order to ensure that the JAM supported
hardware remains operational across GRES switchover, please install JAM package
on the other RE also
jam-mpc7-8-9-x86-64-15.1F4.15-C1.9 has been installed successfully

{backup}

user@router>

```

4. (Optional) Run the **show chassis fpc pic-status** command to display the status of the new line card.

For example, the following sample output shows the status of the new line card installed in slot 19.

```

{master}
user@router> show chassis fpc pic-status
Slot 19 Present      MPC7E 3D MRATE-12xQSFP-XGE-XLGE-CGE

{master}

user@router>

```



**NOTE:** The status **Present** indicates that the router can recognize the new line cards. To make the new line cards operational, you must bring them online.



5. Run the **request chassis fpc slot *slot-number* online** command to bring the newly installed line card online.

For example, the following sample output shows that the line card is being brought online.

```
{master}
user@router> request chassis fpc online slot 19
Online initiated, use "show chassis fpc" to verify

{master}
user@router>
```

6. (Optional) Run the **show chassis fpc pic-status** command to display the status of the newly installed line card.

For example, the following sample output shows the status of the line card in slot 19 and the installed PICs.

```
{master}
user@router> show chassis fpc pic-status
Slot 19  Online      MPC7E  3D MRATE-12xQSFP-XGE-XLGE-CGE
        PIC 0  Online      MRATE-6xQSFP-XGE-XLGE-CGE
        PIC 1  Online      MRATE-6xQSFP-XGE-XLGE-CGE

{master}
user@router>
```

The newly installed line card and PICs are online and operational.

7. Run the **show system software detail** command to verify whether the Junos Continuity software package is installed and the hardware components that the package supports.

For example, the following sample output shows that Junos Continuity package is installed on the router and supports MPC7E.

```
user@router> show system software detail
fips-mode-x86-32-20151223.164524_builder_junos_151_f4  --  fips mode
Requires: junos-runtime32
Provides:
jam-mpc7-8-9-x86-64-15.1F4.15-C1.9  --  jam mpc7 8 9
Hardware Supported: MPC7E 3D 40XGE, MPC7E 3D MRATE-12xQSFP-XGE-XLGE-CGE,
                   MPC8E 3D, MPC9E 3D, MRATE-12xQSFP-XGE-XLGE-CGE MIC,
                   Switch Fabric Board 2 (SFB2)
Requires: kernel64
Provides: jam-mpc7-8-9-64
Required by:
jdocs-x86-32-20151223.164524_builder_junos_151_f4  --  jdocs
```

```
Requires: junos-runtime32
Provides:
jpfe-X2000-x86-32-20151223.164524_builder_junos_151_f4 -- jpfe X2000
Requires: junos-runtime32
  Provides:
jpfe-common-x86-32-20151223.164524_builder_junos_151_f4 -- jpfe common

...
```

- Related Documentation**
- [Junos Continuity Software Overview on page 3](#)
  - [Uninstalling Junos Continuity Software Package on page 36](#)

---

## Uninstalling Junos Continuity Software Package

You can uninstall the Junos Continuity software package by using the **request system software delete software-package** command. Before you uninstall Junos Continuity software package, you must take the line cards that Junos Continuity software supports offline.

This topic guides you through the uninstallation of the Junos Continuity software standalone package. The steps for uninstalling the Junos Continuity software package bundled with Junos OS are similar to those for downgrading Junos OS to an earlier release. See *Software Installation and Upgrade Guide* for more information about downgrading Junos OS.



**NOTE:** If GRES is enabled, you must uninstall the Junos Continuity software package from both the primary and the backup Routing Engines.

---

To uninstall the Junos Continuity software package:

1. (Optional) Run the **show version** command to verify that the Junos Continuity software package is installed on the router. For example, on an MX2020 router that has Junos Continuity software installed:

```
{master}
user@router> show version
Hostname:
Model: mx2020
Junos: 15.1F4.15
JUNOS OS Kernel 64-bit [20151204.318939_builder_stable_10]
JUNOS OS libs [20151204.318939_builder_stable_10]
JUNOS OS runtime [20151204.318939_builder_stable_10]
JUNOS OS time zone information [20151204.318939_builder_stable_10]
JUNOS OS libs compat32 [20151204.318939_builder_stable_10]
JUNOS OS 32-bit compatibility [20151204.318939_builder_stable_10]
JUNOS py base [20151223.164524_builder_junos_151_f4]
JUNOS OS crypto [20151204.318939_builder_stable_10]
JUNOS network stack and utilities [20151223.164524_builder_junos_151_f4]
JUNOS modules [20151223.164524_builder_junos_151_f4]

...

JUNOS Online Documentation [20151223.164524_builder_junos_151_f4]
JUNOS 64-bit JAM Plugin Software Suite (MPC7E/8E/9E)
[20151224.015503_builder_junos_151_x56_d10]
JUNOS FIPS mode utilities [20151223.164524_builder_junos_151_f4]

{master}
user@router>
```

The **show version** command output indicates that the Junos Continuity software package (**JUNOS 64-bit JAM Plugin Software Suite**) is installed on the router.

2. Take the line card that Junos Continuity software supports offline by using the **request chassis fpc slot *slot-number* offline** command. For example, the following sample output shows that the line card is being taken offline.

```
{master}
user@router> request chassis fpc offline slot 19
Offline initiated, use "show chassis fpc" to verify

{master}
user@router>
```

3. (Optional) Verify that the line card is taken offline by using the **show chassis fpc** command. For example, the following sample output shows the status of line card after it is taken offline.

```
{master}
user@router> show chassis fpc
```

```

      Utilization (%)
Slot State      Temp  CPU Utilization (%)  CPU Utilization (%)  Memory
(MB) Heap      Buffer  (C)  Total  Interrupt    1min   5min   15min  DRAM
0  Empty
1  Empty
2  Empty
3  Empty
...
16 Empty
17 Empty
18 Empty
19 Offline      ---Offlined by cli command---

master}

user@router>

```

4. Run the **request system software delete software-package** command to uninstall Junos Continuity software package. For example, to uninstall the **jam-mpc7-8-9-x86-64-15.1F4.15-C1.9** package:

```

{master}
user@router> request system software delete jam-mpc7-8-9
Uninstalling jam-mpc7-8-9-x86-64-15.1F4.15-C1.9
chassisd un-loaded successfully
chassisd un-loaded successfully for fabric
/packages/db/jam-mpc7-8-9-x86-64-15.1F4.15-C1.9
cosd un-loaded successfully
dcd un-loaded successfully
dfwd un-loaded successfully
clksyncd un-loaded successfully
l2ald un-loaded successfully
WARNING: Please Uninstall the JAM package on the other RE also in order to
avoid unexpected behaviour
jam-mpc7-8-9-x86-64-15.1F4.15-C1.9 has been uninstalled successfully

{master}
user@router>

```

The output of the command shows that the software is uninstalled.

5. Run the **show version** command to verify that the Junos Continuity software package is uninstalled successfully.

```

{master}
user@router> show version
Hostname:
Model: mx2020
Junos: 15.1F4.15

```

```

JUNOS OS Kernel 64-bit [20151204.318939_builder_stable_10]
JUNOS OS libs [20151204.318939_builder_stable_10]
JUNOS OS runtime [20151204.318939_builder_stable_10]
JUNOS OS time zone information [20151204.318939_builder_stable_10]
JUNOS OS libs compat32 [20151204.318939_builder_stable_10]
JUNOS OS 32-bit compatibility [20151204.318939_builder_stable_10]
JUNOS py base [20151223.164524_builder_junos_151_f4]
JUNOS OS crypto [20151204.318939_builder_stable_10]
JUNOS network stack and utilities [20151223.164524_builder_junos_151_f4]
JUNOS modules [20151223.164524_builder_junos_151_f4]
...
JUNOS Online Documentation [20151223.164524_builder_junos_151_f4]
JUNOS FIPS mode utilities [20151223.164524_builder_junos_151_f4]

{master}
user@router>

```



**NOTE:** The show version command output indicates that the Junos Continuity software package (JUNOS 64-bit JAM Plugin Software Suite) is not present on the router. If GRES is enabled, repeat Step 4 and Step 5 on the backup Routing Engine to uninstall Junos Continuity software package.

#### Related Documentation

- [Junos Continuity Software Overview on page 3](#)
- [Downloading and Installing Predefined Junos OS Application Signature Packages](#)
- [Installing Junos Continuity Software Package to Support New Hardware on page 31](#)

